Era Aviation, Inc.

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PROCESS SPECIFICATION

PROCESS SPECIFICATION NO. 4021

ASSEMBLY PROCEDURES - FLEXIBLE HOSE

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1 SCOPE

1.1 Purpose

The purpose of this process specification is to provide instructions for assembling flexible fuel and oil hoses for use on aircraft systems. These hoses are primarily for use on Era helicopters and FAA approved sub-system modifications. However, they may be use on any aircraft sub-system if the application has been FAA approved.

1.2 Limitations

This specification shall only be used for assembly of Aeroquip Corp. flexible hose components. Component parts made by other companies shall not be substituted during the manufacture of these hose assemblies.

1.3 Hose Types

The hose "Type" defines the kind of hose (i.e., synthetic rubber, convoluted Teflon, smooth Teflon, etc.) to be used in the assembly. This specification covers the assembly procedures for the following four Types of flexible hoses:

HOSE TYPE	ERA HOSE DESIGN SPECIFICATION	AEROQUIP HOSE PART NUMBER
I	PS4020	601 & AE701
II	PS4022	AE645
III	PS4023	AE641 AE541 & AE441
IV	PS4025	AE240 AE566 AE666 AE667

Therefore, the flexible hose design process specification shall specify the hose assembly procedures as follows:

"Hoses shall be fabricated in accordance with ERA Process Specification No. PS4021, Type _____ (i.e., I, II, III, or IV)".

2 APPLICABLE DOCUMENTS

The following documents form a part of this standard to the extent specified herein. Unless otherwise specified, the latest issue in effect shall apply.

2.1 Era Aviation Process Specifications

This assembly procedures Process Specification shall only be used in conjunction with the following flexible hose design Process Specifications:

2.1.1 **PS4020** - Hose assembly - medium pressure fuel and oil, elastomer (synthetic rubber)

2.1.2 **PS4022** - Hose assembly - medium pressure fuel, convoluted TFE (Teflon), non-arcing

2.1.3 **PS4023** - Hose assembly - medium pressure fuel, convoluted TFE (Teflon)

2.1.4 **PS4025** - Hose assembly - medium pressure fuel and oil, smooth tube TFE (Teflon)

2.2 Aeroquip Corp. Engineering Standards (ACES)

2.2.1 **Process 43** - Hose assemblies - AE402, AE503, and 601/AE701 hose processing and acceptance testing

2.2.2 **Process 60** - Hose assemblies - Processing and acceptance testing of AE240, 566, 666, and 667

2.2.3 **Process 552** - Sleeve - assembly of protective

2.2.4 **Process 2122** - Hose and hose assemblies - AE440, AE441, AE442, AE443, AE540, AE541, AE640, AE641, AE840, and AE841, convoluted polytetrafluoroethylene, fabrication, and acceptance testing

2.2.5 **Process 2521** - Hose assemblies using AE645, AE646, and AE746 hose - processing and acceptance testing

2.3 Military Specifications

2.3.1 **MIL-M-87958** - Wire or cable marker and identification label

3 PREASSEMBLY PROCESSING

3.1 Determining Cut Hose Length

The theoretical nominal cut hose length dimension "J" shall be as specified on the Aeroquip hose assembly drawing or calculated using the following formula:

Hose length "J" = desired hose assembly length - Fitting #1 "A" length - fitting #2 "A" length

NOTE:

See Figure 3-1 for location of dimension "A" on hose end fitting.

NOTE:

The actual hose length may require adjusting in order to obtain the correct hose assembly length. This adjustment may be due to growth of the hose from compression of the hose within the fitting, hose lot variability, hose cutting methods, equipment variability, hose style, or other process variables.

CAUTION: When measuring hose for cutoff, leave the hose loose; do not stretch or push the hose during this operation.

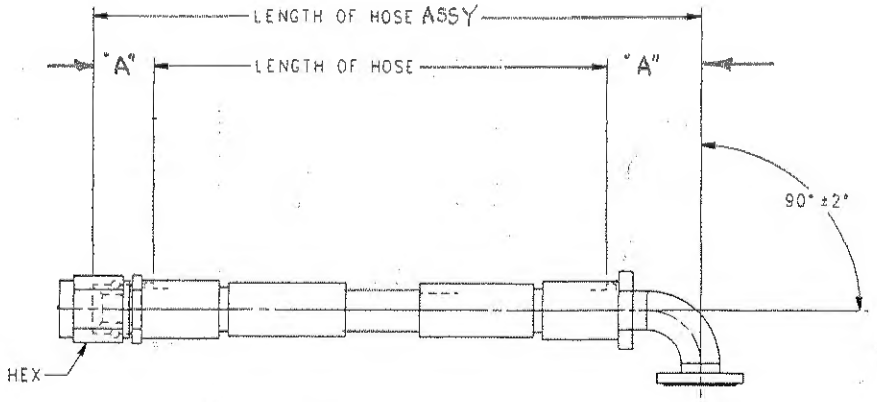


Figure 3-1

3.2 Cutting Hose

3.2.1 The hose shall be wrapped with ¾ inch wide gummed-fabric or fiberglass tape (1 ½ to 2 wraps max), where the hose will be cut. Cut the hose through the tape with a power driven, circular, knife edge blade. Tape is not required when cutting AE566 hose.

3.2.2 The following methods are recommended for the cutting operation:

3.2.2.1 Binding may be reduced by bending the hose slightly.

3.2.2.2 A water-soluble oil may be used to cool the power-driven blades.

NOTE: Do not crush the hose during the cutting operation.

3.3 Captive Sleeves

Captive sleeves must be assembled to the hose prior to assembly processing.

3.4 Polyester Chafe Guards

On AE566 (Type IV) hose, the polyester chafe guard must be removed from each end of the hose prior to assembly on the end fittings. See Table 3-2 for the amount of chafe guard to be removed.

HOSE SIZE	"A" Dimension (±.020) For Skive Length
-3	0.875
-4	1.056
-5	1.084
-6	1.103
-8	1.229
-10	1.330
-12	1.402
-16	1.505
-20	1.760
-24	1.832

TABLE 3-2
CHAFE GUARD REMOVAL

3.5 Precleaning

The components shall be cleaned free of all greases, oil and loose or foreign particles prior to being assembled.

4 ASSEMBLY PROCESSING

4.1 Hose Type I

Assembly processing for 601 and AE701 hose with reusable end fittings shall be accomplished as follows:

4.1.1 **Assembling The Sockets To The Hose**

4.1.1.1 If fabric cutting tape was left in place on the hose ends to facilitate hose cutting, it must be removed prior to performing additional assembly operations.

4.1.1.2 Assemble the sockets onto the hose. Insert the hose into the socket with a minimum number of socket rotations. The end of the hose shall be positioned squarely against the threaded shoulder portion of the socket (see Figure 4-1). Do not force an excessive amount of hose into the socket.

4.1.1.3 Inspect for wires in the socket thread areas.

4.1.1.4 When machine assembled, the socket assembly speed shall not exceed 40 RPM.

4.1.2 **Marking The Hose To Detect "Push-Off" Of The Socket During Assembly**

4.1.2.1 Unless otherwise specified on the hose assembly drawing, a permanent white stripe shall be painted on the hose assembly adjacent to the skirt end of the socket (see Figure 4-1).

Note: Marking to detect "push-off" shall be required on all assemblies that use CRES sockets.

Note: The paint stripe is not required when the hose and socket are clamped together during nipple insertion in sizes -3 through -16.

4.1.2.2 Paint-free hose assemblies may be processed per 4.1.2.1 above, except a plastic or adhesive tape may be used.

4.1.2.3 The paint stripe is intended as a permanent mark and shall not be removed during subsequent processing. Marking tape shall be removed only after pressure testing (see paragraph 7.2) and inspection (see paragraph 7.1).

4.1.3 **Assembling the Nipple to the Hose-Socket Subassembly**

4.1.3.1 Refer to Figure 4-2 and Table 4-3. For machine assembly, hold the hose-socket subassembly as a unit while assembling the nipple.

4.1.3.2 Lubricate the nipple shank, nipple thread, and the bore of the hose with SAE 30 oil or Aeroquip assembly lubricant P/N 222070.

CAUTION: Excessive lubricant must be avoided. Lubricant entrapped in the annular cavity (lip-seal area) of the nipple may cause nipple collapse, hose "push-off" or other malfunctions.

4.1.3.3 Push the nipple shank into the hose bore of the hose-socket subassembly until the nipple thread engages the socket thread. Then manually assemble nipple to socket for 2 or 3 threads to ensure proper engagement.

4.1.3.4 Tighten the nipple into the hose-socket subassembly until the gap between the socket and the face of the nipple hex is as specified on the hose assembly drawing and Table 4-3. During assembly, the nipple spur cuts a cylindrical lip in the tube, forcing the wire reinforcement to the outside of the spur and the tube into the annular cavity (reference Figure 4-4).

NOTE: Hose assemblies with elbows on each end (-16 and larger) should have the fittings assembled to the maximum gap on each end. Adjustment of the fittings can then be made for the proper index angle, by turning one or both of the fittings in the tightening direction.

NOTE: Machine assembly of the nipple is the same as outlined above except the assembly RPM shall be as specified in Table 4-3. An assembly mandrel which extends approximately 0.25-inch beyond the end of the nipple shank may be used to assist in assembling the nipple.

4.1.3.5 To adjust index angles, the nipples may be backed off 15 degrees maximum providing:

- The nipple-socket gap does not exceed the gap limit specified in Table 4-3.

  NOTE: The gap shall not allow a 0.031 in. gage to be fully inserted, so that it touches the O.D. of the nipple. Partial insertion of the gage is not cause for rejection.

- The adjustment is to be made within 4 hours from the time of initial assembly.

4.1.4 **Post-Assembly Inspection**

Using the paint stripe or tape wrap (as applicable) as an indicator, check each end of each assembly to determine if axial movement (push-off) of the socket relative to the hose occurred during assembly. No movement is allowed in sizes -10 and below. An accumulated movement of 0.062 inches is allowable in sizes -12 and above from time of assembling the nipple to completion of proof testing.

NOTE: The paint stripe shall not be repainted, nor the tape repositioned.

4.2 Hose Type II

Assembly processing for AE645 hose with permanently attached (compression crimp) end fittings shall be accomplished as follows:

4.2.1 **Fiberglass Tape**

The fiberglass cutting tape that was used on the ends to facilitate hose cutting must be removed before performing additional assembly operations.

4.2.2 **Assembly the Sockets to the Hose**

Assemble a socket to each end of the cut hose as shown in Figure 4-5.

4.2.3 **Assembling the Nipple to the Hose**

4.2.3.1 -4, -6, -8, and -10 Size Hose

Manually push the nipple into the hose until the tube bottoms on the nipple shoulder and the socket bottoms on the nipple hex. Gap between shoulder and tube shall be .000 to .020 inches.

Caution: The tube must not extend over the nipple shoulder. This condition is unacceptable and can create a leak path.

4.2.3.2 -12 Size Hose and Larger

Grip the hose at the end of the socket. Manually turn the nipple into the hose with a threading motion until the tube bottoms on the nipple shoulder and the socket bottoms on the nipple hex (see Figure 4-6).

Caution: The tube must not extend over the nipple shoulder. This condition is unacceptable and can create a leak path.

4.2.3.3 -16 size hose (push-in style)

Push the nipple into the hose until the hose is .00" to .06" from the nipple shoulder (see Figure 4-7).

Caution: The tube must not extend over the nipple shoulder. This condition is unacceptable and can create a leak path.

4.2.3.4 Crimp the socket onto the hose nipple subassembly with crimp jaws conforming to the part numbers shown in Table 4-8.

4.2.3.5 After crimping, check the "A" diameter on each end of every assembly as shown in Figure 4-9 and Table 4-10.

4.3 Hose Type III

Assembly processing for AE441, AE541, and AE641 hoses with permanently attached (compression crimp) end fittings shall be accomplished as follows:

4.3.1 **Fiberglass Tape**

If fabric cutting tape was left in place on the ends to facilitate hose cutting, it must be removed before performing additional assembly operations.

4.3.2 **Assembling the Sockets to the Hose**

Assemble a socket to each end of the cut hose (see Figure 4-5).

4.3.2.1 Hose with Polyester Braid Cover

The polyester braid must be removed prior to assembling sockets. The hot wire method is recommended (see Figure 4-18).

4.3.2.2 Hose with Silicone Fire Protection

Prior to assembly of sockets, the silicone cover must be removed from the ends.

4.3.3 **Assembling the Nipple to the Hose**

4.3.3.1 -4, -6, -8, and -10 Size Hose

Push the nipple into the hose until the tube bottoms on the nipple shoulder and the socket bottoms on the nipple hex.

4.3.3.2 -12 Size Hose and Larger (thread-in style)

Grip the hose at the end of the socket. Turn the nipple into the hose with a threading motion until the tube bottoms on the nipple shoulder. Position the socket against the nipple hex by pushing on the wire braid (see Figure 4-6).

4.3.3.3 -12 Size Hose and Larger (push-in style)

Push the nipple into the hose until the tube is .00 to .06 inches from the nipple shoulder (see Figure 4-7). Position the socket against the nipple next by pushing on the wire braid (see Figure 4-7).

NOTE: A spacer plate will aid in obtaining the proper spacing.

4.3.3.4 Double Elbow Assemblies (thread-in style)

Hose assemblies with elbows on both ends should have the end fittings assembled and the rotation angle set within 10 degrees. Elbows may be backed off up to 90 degrees per end to meet the rotation requirements. If additional rotation is required, disassemble one end fitting and reassemble 180 degrees from initial insertion. This is possible due to a double lead hose inner tube. Crimp one end fitting and set the final rotation angle as required, then crimp the second fitting.

CAUTION: Reinforcement wires shall extend over the nipple shoulder as indicated in Figure 4-6.

4.3.3.5 Double Elbow Assemblies (push-in style)

Before crimping, the rotation angle for a double elbow assembly shall be set. Set the rotation angle as close as possible in order to minimize fitting rotation.

4.3.3.6 Crimping

Crimp the socket onto the hose/nipple subassembly with crimping jaws conforming to the configuration defined by the tool drawings listed in Table 4-11.

4.3.3.7 Verify Crimping

After crimping, check the "A" diameter on each end of every assembly as shown in Figure 4-9 and Table 4-12.

4.4 Hose Type IV

Assembly processing for AE240, AE566, AE666, and AE667 hoses with reusable end fittings shall be accomplished as follows:

4.4.1 **Assembling the Sockets to the Hose**

4.4.1.1 Assemble two sockets on the hose. The sockets are most readily assembled, back-to-back, over the necked-down end of the cut hose. AE566 hose must have the sockets installed from each end of the hose.

4.4.1.2 If the fabric cutting tape was left in place on the hose ends (to facilitate hose cutting and socket assembly) it must be removed before performing additional assembly operations.

4.4.2 **Sizing of the Hose-Tube**

4.4.2.1 Push the hose onto the firmly held nipple. the hose shall be started carefully to prevent damage to the end of the tube. An assembly tool simulating a nipple may be used initially in lieu of the nipple.

4.4.2.2 Oscillate the hose to expand the tube and separate the wire reinforcement from the tube.

4.4.2.3 Remove the nipple from the hose.

4.4.3 **Assembling the Sleeve to the Hose**

4.4.3.1 To aid in assembling the sleeve to the hose, the wire braid may be flared by inserting a hollow knife-edge mandrel between the tube and wire.

CAUTION: The outside diameter of the tube must not be scratched or cut.

4.4.3.2 Insert the sleeve between the tube and wire braid until the tube bottoms out against the inside shoulder of the sleeve (see Figure 4-13).

4.4.3.3 Fit the tube to the sleeve by pushing the sleeve and hose onto the nipple (or tool simulating the nipple) with a steady force, until the sleeve bottoms against the nipple.

4.4.3.4 Remove the nipple from the sleeve and hose by using a slight rotating motion. Check to insure that the tube is bottomed against the sleeve shoulder as illustrated in Figure 4-13.

4.4.4 **Seating the Socket to the Hose-Sleeve Subassembly (CRES optional)**

4.4.4.1 Push the special tool (nipple with threads removed or a tool simulating a nipple) into the hose-sleeve-socket subassembly until the tool contacts the face of the sleeve.

4.4.4.2 Seat the socket by pulling the socket over the hose-sleeve subassembly, to establish the dimensional relationship between the end of the socket and the face of the sleeve, as illustrated in Figure 4-14.

4.4.4.3 Remove the special tool and remove any wires in the threaded area of the socket.

4.4.5 **Assembling the Nipple to the Hose-Sleeve-Socket Subassembly (see Figure 4-15)**

4.4.5.1 Apply lubricant to the thread and sleeve seat portion of the nipple.

4.4.5.2 Push the nipple into the hose-sleeve-socket subassembly until the nipple-seat contacts the sleeve-seat.

4.4.5.3 Pull the socket over the sleeve in one abrupt motion so that the nipple thread and socket thread engage.

Optional: The assembly procedure may be altered by sliding the socket over the sleeve prior to inserting the nipple. Insert the nipple into the hose-sleeve-socket subassembly until the threads engage.

CAUTION: Braid wires should not extend onto the threaded portion of the nipple or the socket.

4.4.5.4 Tighten the socket to the nipple as follows:

a) Gap Fitting: Tighten the socket until the gap between the socket and the nipple-hex is .023 to .046 inches (see Figure 4-15). Rotate (tighten) the socket until the flats on the socket align with the flat on the nipple (±3 degrees). NOTE: Maintain the .023 to .046 inch gap.

b) Torque Fitting: Tighten the socket to the torque specified in Table 4-17. Rotate (tighten) the socket until the flats on the socket align with the flat on the nipple (±3 degrees).

4.4.5.5 Assembly of the nipple to the socket by machine is the same as outlined above, except the assembly speed (RPM) shall not exceed those listed in Table 4-17.

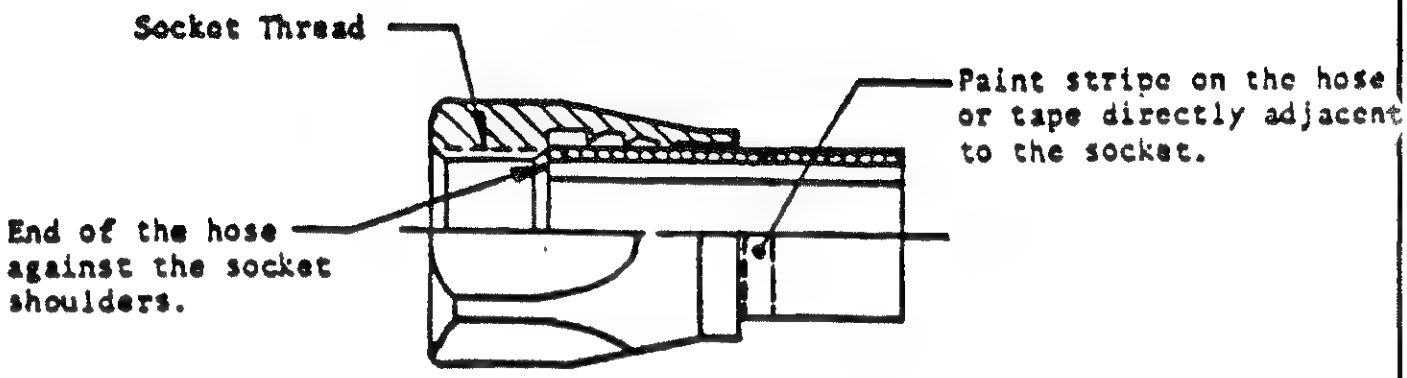


Figure 4-1

Relative Positioning of the Hose, Socket, and Paint Stripe

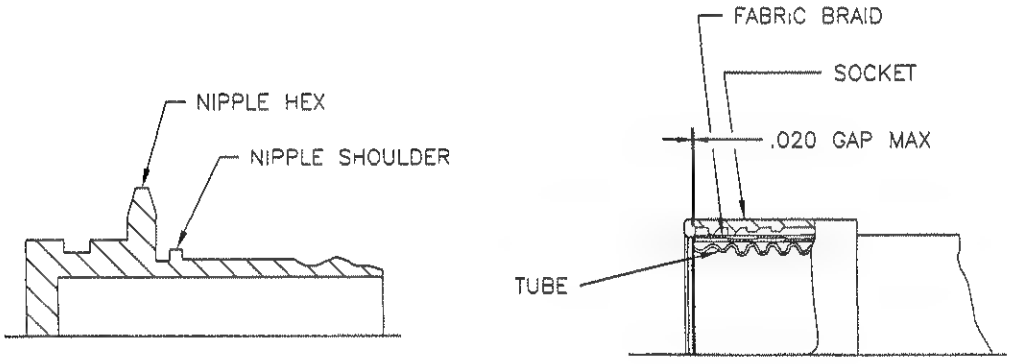


Figure 4-2

Component Illustration and Definition

Hose Size	Maximum Machine RPM during Nipple Assembly	Nipple-Socket Gap
-3 -4 -5 -6 -8 -10 -12 -16	180	0.031 inch-maximum
-20 -24 -32	60	

TABLE 4-3
NIPPLE - SOCKET GAP

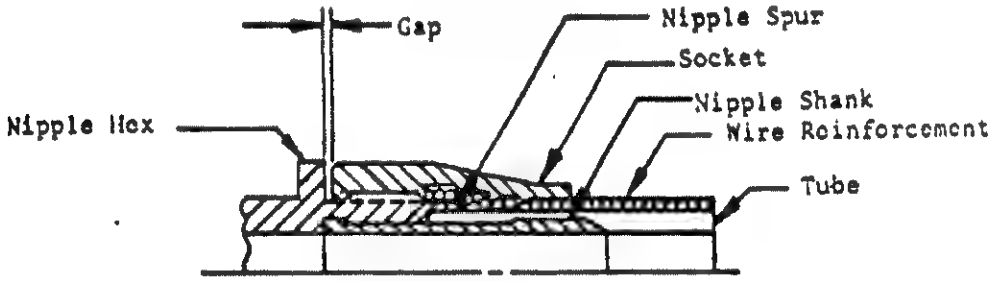


FIGURE 4-4
NIPPLE-SOCKET GAP

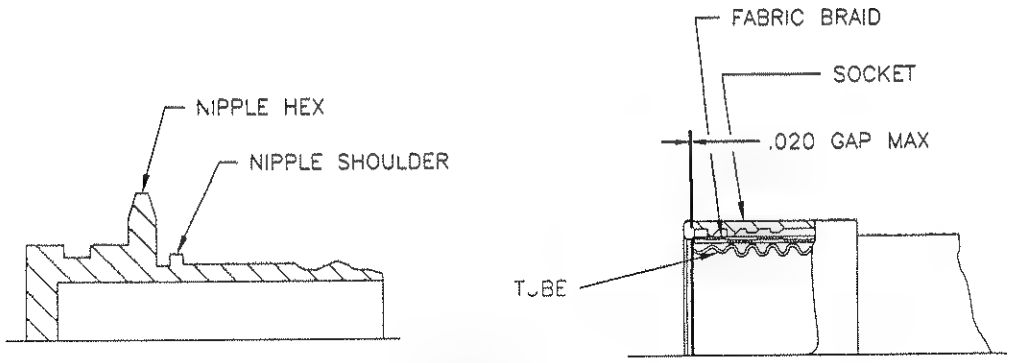


FIGURE 4-5
COMPONENT ILLUSTRATION AND DEFINITION

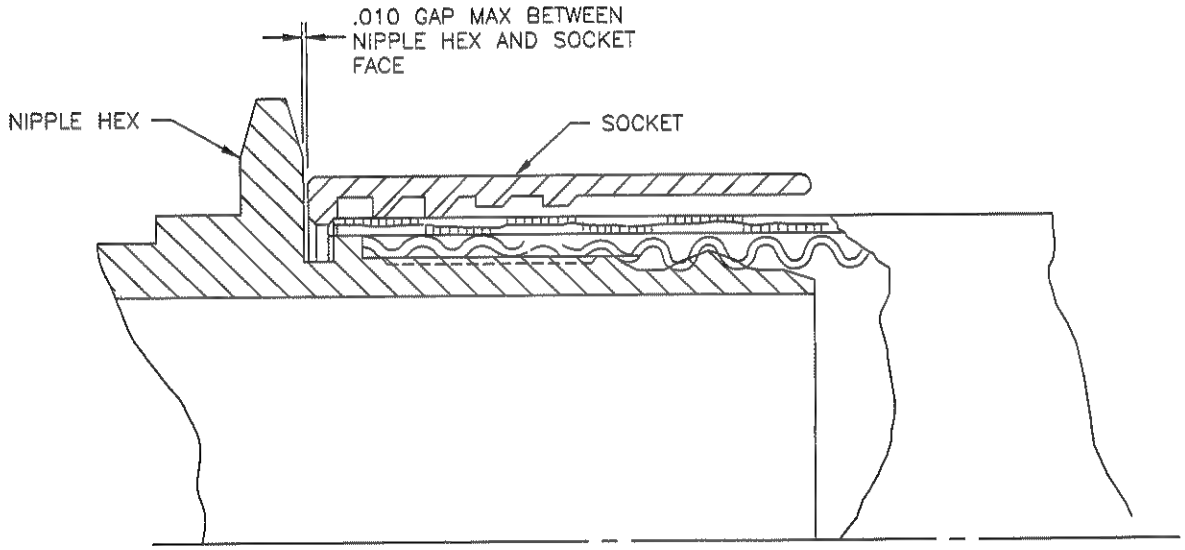


FIGURE 4-6
COMPONENT RELATIONSHIP AFTER POSITIONING THE SOCKET

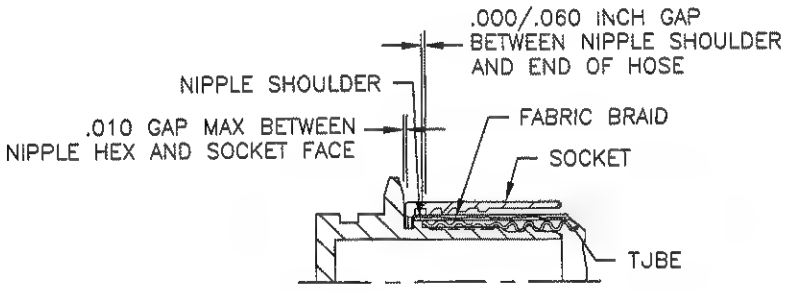


FIGURE 4-7
PUSH-IN STYLE

HOSE SIZE	NUMBER OF JAWS PER SET	CRIMP JAW PART NUMBER	
-4	8	S1084-1-128	S1347-1-68
-6	8	S1084-1-90	S1347-1-32
-8	8	S1084-1-85	S1347-1-33
-10	8	S1084-1-84	S1347-1-34
-12	8	S1084-1-122	S1347-1-63
-12	8	S1084-1-82 (Ti/CRES only)	

TABLE 4-8
CRIMPING TOOL DATA

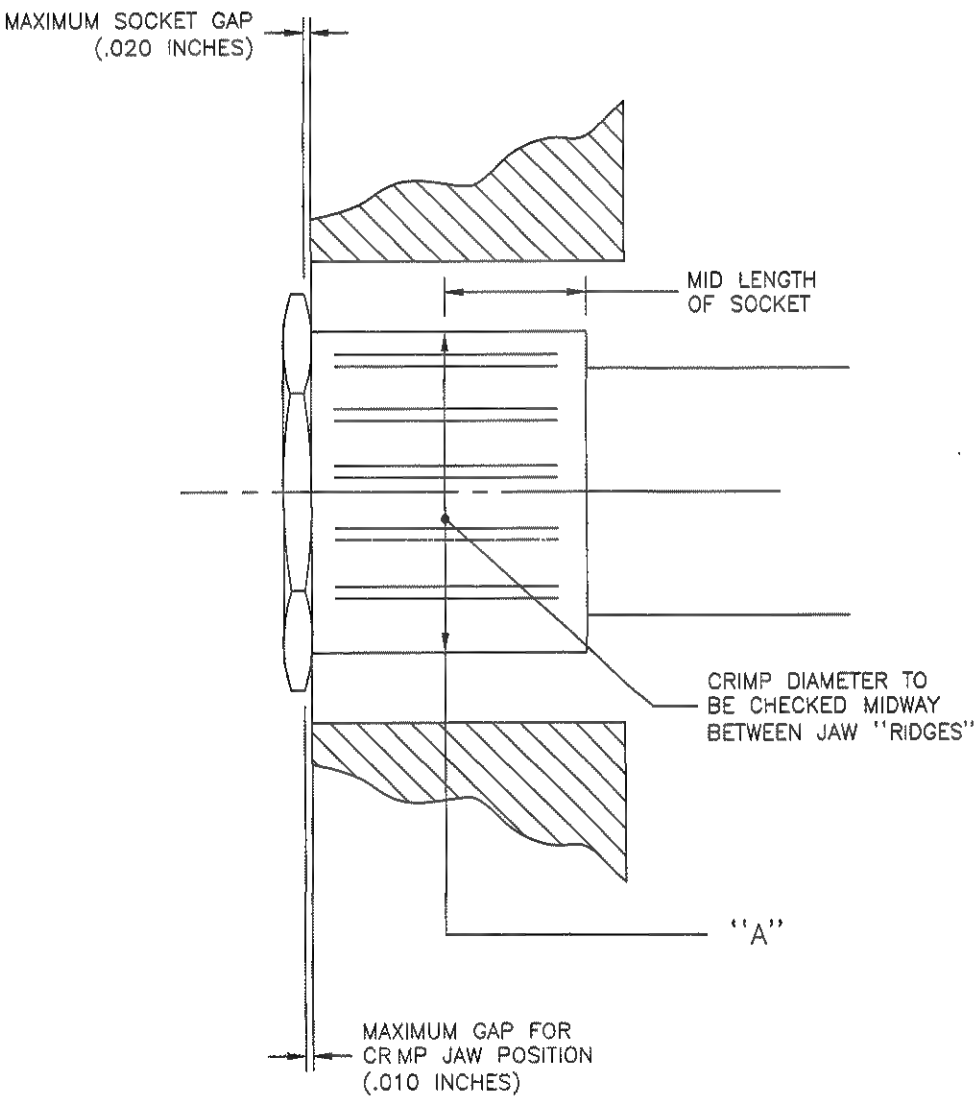


FIGURE 4-9
AFTER CRIMP INSPECTION DIMENSIONS

"A" DIAMETER (inches)			
Hose Dash Size	CRES Socket and Aluminum Nipple	CRES Socket and Titanium Nipple	CRES Socket and CRES Nipple
-4	0.535/0.530	0.535/0.530	0.535/0.530
-6	0.640/0.645 (Wrap Tube) (1)	0.640/0.645 (Wrap Tube) (1)	0.640/0.645 (Wrap Tube) (1)
-6	0.610/0.616 (Bump Tube) (1)	0.610/0.616 (Bump Tube) (1)	0.610/0.616 (Bump Tube) (1)
-8	0.795/0.800	0.795/0.800	0.795/0.800
-10	0.865/0.870	0.889/0.894	0.889/0.894
-12	1.100/1.105	1.125/1.130	1.125/1.130
-16	1.315/1.320	1.330/1.355	1.330/1.335

Table 4-10
AFTER CRIMP INSPECTION DIMENSIONS

Hose Size	No. of Jaws Per Set	Crimp Jaw Part Number			
		F238	S1084	S1347	Brock
-4	8	Use S1084 Jaw	S1084-1-128	S1347-1-68	--
-6	8		S1084-1-90	S1347-1-32	--
-8	8		S1084-1-85	S1347-1-33	--
-10	8		S1084-1-84	S1347-1-34	--
-12	8		S1084-1-82	S1347-1-35	--
-16	8		S1084-1-83	S1347-1-36	F-3138-1-8
-20	8		S1084-1-71	S1347-1-37	F-3138-1-9
-24	8		S1084-1-72	S1347-1-38	F-3138-1-10

Table 4-11
CRIMPING TOOL DATA

Hose Size	"A" Diameter		
	CRES Thread-in Style	CRES Socket and Aluminum	CRES Push-in Style
-4	--	.530/.535	.530/.535
-6	--	.639/.644 (Wrap Tube) (2)	.643/.648 (Wrap Tube) (2)
	--	.622/.628 (Bump Tube) (2)	.622/.628 (Bump Tube) (2)
-8	--	.823/.828	.815/.820
-10	--	.910/.915	.890/.895
-12	1.125/1.130	1.155/1.160	1.125/1.130
-16	1.330/1.335	1.340/1.345	1.330/1.335
-20	1.585/1.590 (3) 1.572/1.578 (4)	1.620/1.625	1.580/1.585
-24	1.843/1.848 (1)	1.855/1.860	1.833/1.838

NOTES:

(1) Nipples manufactured from high-strength materials (15-5 pH CRES, 21-6-9 CRES, Titanium, etc.) may cause the socket to appear bulged.

The crimp dimension shall be checked as follows:

a) Middle of socket: 1.843/1.848
b) Next to nipple hex: 1.834
c) Socket skirt: 1.829/1.848

(2) The difference between wrap tube and bump tube can be distinguished by the fact that the wrap tube has a fiberglass outer layer on the tube, whereas, the bump tube does not.

(3 Crimp diameter for all CRES non-welded/brazed fittings

4 Crimp diameter for all CRES welded/brazed fittings

Table 4-12
AFTER CRIMP INSPECTION DIMENSIONS
(All Dimensions Are in Inches)

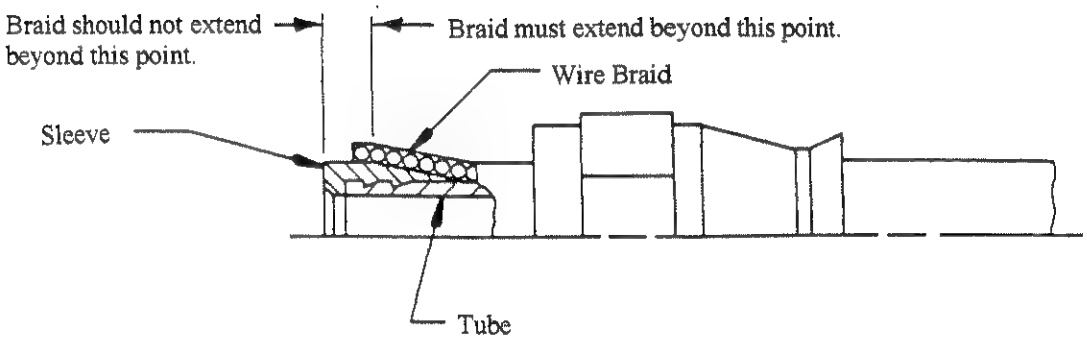


FIGURE 4-13
RELATIVE POSITIONING OF SLEEVE, TUBE, AND WIRE BRAID

PRESEAT DIMENSIONS

HOSE SIZE	-8	-10	-12	-16	-20	-24
"A"	.200	.200	.250	.300	.300	.400

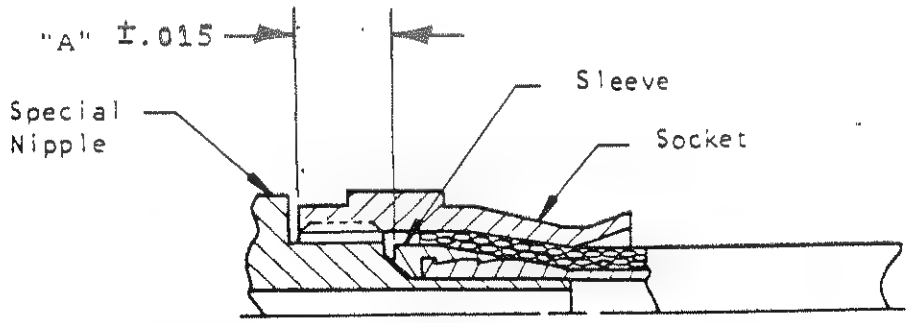


FIGURE 4-14
RELATIONSHIP OF SOCKET AND HOSE SLEEVE
SUBASSEMBLY AFTER SEATING THE SOCKET
ALL ALUMINUM - (optional on CRES)

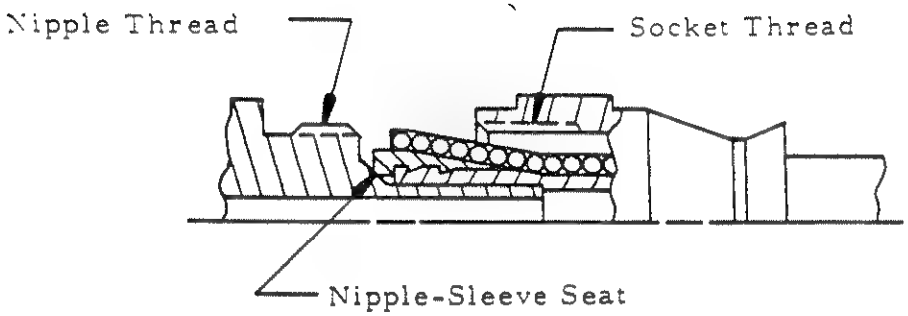


FIGURE 4-15
ASSEMBLING NIPPLE

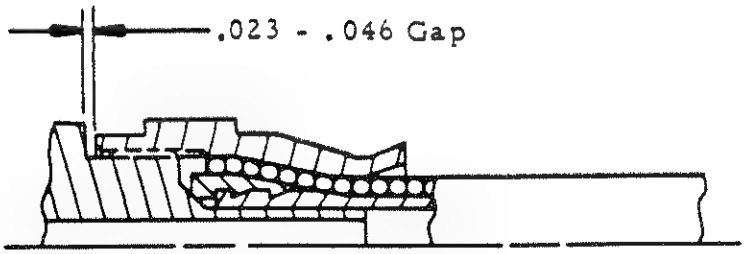


FIGURE 4-16
ASSEMBLED NIPPLE

Hose Size	Machine Maximum RPM	Assembly Torque Prior to Alignment of the Flats (ft.-lbs.)	After Assembly, but before Proof Torque (70% of Assembly Torque in ft.-lbs.)	After Proofing Torque (50% of Assembly Torque) (ft.-lbs.)
-3	70	8.0	5.6	4.0
-4	70	10.0	7.0	5.0
-5	70	12.0	8.4	6.0
-6	70	15.0	15.1	7.5
-8	70	23.0	16.1	11.5
-10	30	40.0	28.0	20.0
-12	30	55.0	38.5	27.5
-16(1)	30	70.0	49.0	35.0
-12Z(2)	30	75.0	52.5	37.5
-16Z(3)	30	85.0	59.5	42.5
-20Z(3)	30	140.0	98.0	70.0
-24Z(3)	30	190.0	133.0	95.0

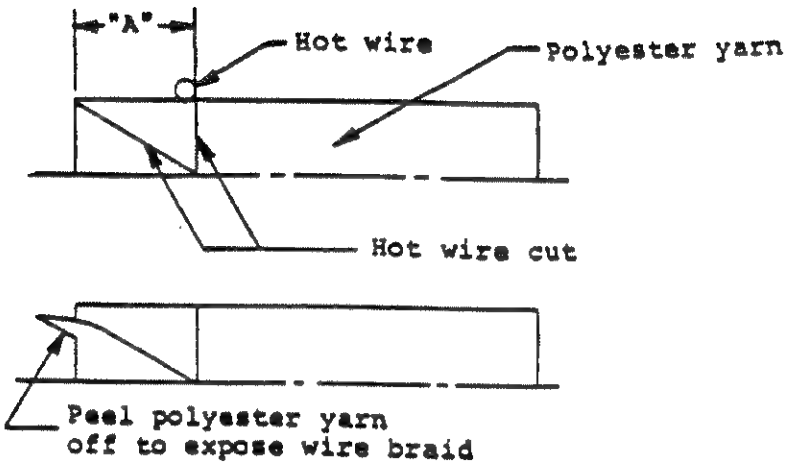
NOTES:

(1) 666 Type hose only (single wire braid)

(2 667 Type hose only (2 wire braid)

(3) 667 and AE240 Type hose only (2 wire braid)

Table 4-17
TORQUE REQUIREMENTS FOR AE240, 666, AND 667 TYPE HOSE TORQUE FITTINGS



Hose Size	-4	-6	-8	-10	-12	-16	-20	-24	-32
Dim. "A" (in.)	.625	.625	.688	.812	.875	.906	1.312	1.312	1.312

FIGURE 4-18
REMOVAL OF POLYESTER ON HOSE ENDS

5 SPECIAL PROCESSING

5.1 Abrasion Sleeves

5.1.1 Scope

This section outlines the process for assembly of a "shrinkable" type sleeve for hose assemblies which requires a protective sleeve. This standard applies only to Aeroquip AE105 sleeves.

5.1.2 Determination of Correct Sleeve Size

A sleeve should not be installed over a component diameter that is:

5.1.2.1 Greater than the maximum recovered diameter plus 50 percent of the difference between the minimum expanded diameter and the maximum recovered diameter, as an "overtight" sleeve would be the results.

5.1.2.2 Less than the maximum recovered diameter, unless a loose sleeve is acceptable. Use of a sleeve size other than as specified may result in loose or an overtight sleeve.

5.1.2.3 If the minimum expanded sleeve I.D. is only slightly smaller than the nipple assembly O.D., then Elastrator Pliers, or equivalent, may be used to stretch the sleeve over the nipple assembly and the sleeve may then be "milked" onto the hose.

5.1.3 Pre-Installation of Sleeving

When possible, the hose assemblies should be completely assembled, proof tested, cleaned, and inspected prior to assembly and shrinking of the sleeve.

5.1.4 Sleeve Installation

Sleeve shall be cut to length and positioned on the assembly. It may be necessary to increase the sleeve length to compensate for longitudinal shrinkage.

5.1.5 **Shrinking**

Heat sleeve and hose assembly at 350°F ± 50° until shrinkage occurs.

5.1.6 **Cooling**

After shrinkage, the sleeve may be cooled with filtered compression dry air or cooled in ambient room air.

5.1.7 **Trimming**

Excess sleeve may be trimmed.

5.1.8 **Wrinkles**

The height of any wrinkle shall not exceed the following limits:

Sleeve I.D. (in.) Before Shrinking	Maximum Wrinkle Height (in.)
0 to 0.80	0.035
0.80 to 1.20	0.04
1.20 and larger	0.05

5.1.9 **Inspection of Sleeving**

The sleeve installation characteristics to inspect shall be as follows:

		YES	NO
5.1.9.1	Was the correct part no. sleeve used?	____	____
5.1.9.2	Is the sleeve length and position correct?	____	____
5.1.9.3	Does the sleeve have any defects or mutilations?	____	____
5.1.9.4	Does the sleeve have any blisters?	____	____
5.1.9.5	Does the sleeve have any wrinkles?	____	____
5.1.9.6	Is the sleeve snug and will not slip?	____	____

5.2 Firesleeves

5.2.1 **Hose Type I and IV**

5.2.1.1 All cut lengths of AE102 silicone fiberglass firesleeve shall have both ends dipped in Aeroquip AE10187 End Dip to seal the fiberglass. The sleeve shall be submerged momentarily for a distance of .5 to 1.0 inches and allowed to dry at room temperature prior to installation on the hose.

5.2.1.2 The silicone fiberglass sleeve shall be secured at each end of the hose using an Aeroquip part no. 900591B-(size) stainless steel clamp or equivalent.

5.2.2 **Hose Type II and III**

Firesleeves shall not be installed on type II and III hose assemblies by Era Aviation Inc.

6 IDENTIFICATION

6.1 Identification Information

Identify each hose assembly with "Era Aviation Inc.", the Era Aviation Part No., reference Aeroquip part number (if applicable), "FAA/PMA", Era Work Order No. and assembly date (quarter/year, i.e., 2/00) on an identification band attached to the hose assembly.

6.2 Marking Methods

Markings shall be either:

6.2.1 A fuel-proof marker band meeting specification MIL-M-87958, any color, form and configuration found to be appropriate or equivalent

6.2.2 Steel stamped per MIL-STD-130 on a steel band which shall be a maximum of 1.0" wide and shall remain tight on the hose to prevent chafing. The identification band design shall be approved by Era Aviation engineering.

6.3 I.D. Band Protective Sleeve

Install a 1.3 inch long piece of AE105 sleeve over the I.D. band. The sleeve shall be installed per Section 5.1 of this document prior to the assembly of the last end fitting.

7 QUALITY ASSURANCE PROVISIONS

7.1 Inspection

Each hose assembly shall be inspected as follows:

		YES	NO
7.1.1	Proper end fittings part number?	____	____
7.1.2	Proper hose part number?	____	____
7.1.3	Does hose have broken or missing wires in the wire braid (if applicable)?	____	____
7.1.4	Does the hose have cuts or damage to the inner tube?	____	____
7.1.5	Do the end fittings have visual defects or mutilations?	____	____
7.1.6	Is the fitting crimp diameter correct?	____	____
7.1.7	Is the nut-swivel action acceptable?	____	____
7.1.8	Is the hose assembly length and drop dimensions acceptable?	____	____
7.1.9	Is the angular relationship of the end fittings correct?	____	____
7.1.10	Is the Type II and III hose assembly minimum inside diameter per Table 7-1 acceptable?	____	____
7.1.11	Is the abrasion sleeve (if applicable) installed per Section 5.1.9?	____	____
7.1.12	Is the firesleeve (if applicable) installed per Section 5.2?	____	____
7.1.13	Is the hose assembly identification tag information correct?	____	____
7.1.14	Is the hose assembly identification tag properly installed?	____	____

Hose Size	Minimum Fitting I.D. (before Crimp)	Fitting Configuration Compression Crimp Inspection Ball Size	
		Straights (±.001 in)	Elbows (±.001 in)
-4	0.170	0.125	0.094
-6	0.258	0.219	0.219
-8	0.350	0.296	0.281
-10	0.375	0.310	0.295
-12	0.562	0.500	0.468
-16	0.710	0.719	0.688

TABLE 7-1

BALL DIAMETER FOR INSPECTING
Type II and III HOSE ASSEMBLY I.D.

7.2 Pressure Testing

7.2.1 **Testing Procedure**

Each hose assembly shall be pressure tested as follows, unless otherwise specified on the applicable hose assembly drawing. Any leakage, distortion or malfunction shall be cause for rejection.

7.2.1.1 Ambient Temperature: +70° to 90°F

7.2.1.2 Test Fluid: MIL-H-5606 Hydraulic Fluid

7.2.1.3 Pressure Retention Time: 30 seconds, minimum

7.2.1.4 Proof of Pressure

Type I Hose - specified in Table 7-2
Type II Hose - specified in Table 7-3
Type III Hose - specified in Table 7-4
Type IV Hose - specified in Table 7-5

DATE	ENGINEERING ORDER	EO No / SHT
8/20 01		A-1 1 OF 1
BY: D. NELSON	TITLE: HOSE PROOF PRESSURE	PROCESS SPECIFICATION NO.: 4021
APPROVED BY		PAGE AFFECTED: PAGE 32

REASON FOR CHANGE: REVISED TABLE 7-5.

MINOR CHANGE [X]
MAJOR CHANGE [ ]

IS

Hose Size	-3	-4	-5	-6	-8	-10	-12	-16	-20	-24
Code Letter	D	E	F	G	H	J	K	M	N	P
Proof Pres. Test (psig)	3000	3000	3000	3000	3000	3000	2000	2500	2000	2000

TABLE 7-5
Type IV Hose Proof Pressure

NAS

Hose Size	-3	-4	-5	-6	-8	-10	-12	-16	-20	-24
Code Letter	D	E	F	G	H	J	K	M	N	P
Max Operating Pres. (psig)	1500	1500	1500	1500	1500	1500	1000	1250	1000	1000

TABLE 7-5
Type IV Hose Proof Pressure

DA
8 20 0

ENGINEERING ORDER

EO No
A-1

SH
1 OF

BY
D. NELSON

TITLE
HOSE PROOF PRESSURE

PROCESS SPECIFICATION NO
4021

APPROVED BY
D. Marmill

PAGE AFFECTED
PAGE 32

REASON FOR CHANGE
REVISED TABLE 7-5.

MINOR CHANGE ☒
MAJOR CHANGE

IS

Hose Size	-3	-4	-5	-6	-8	-10	-12	-16	-20	-24
Code Letter	D	E	F	G	H	J	K	M	N	P
Proof Pres. Test (psig)	3000	3000	3000	3000	3000	3000	2000	2500	2000	2000

TABLE 7-5
Type IV Hose Proof Pressure

WAS

Hose Size	-3	-4	-5	-6	-8	-10	-12	-16	-20	-24
Code Letter	D	E	F	G	H	J	K	M	N	P
Max Operating Pres. (psig)	1500	1500	1500	1500	1500	1500	1000	1250	1000	1000

TABLE 7-5
Type IV Hose Proof Pressure

Hose Size	-6	-8	-10	-12	-16	-20	-24
Code Letter	G	H	J	K	M	N	P
Proof Pres. Test (psig)	3000	2500	2500	2000	1500	1300	800

TABLE 7-2
Type I Hose Proof Pressure

Hose Size	-4	-6	-8	-10	-12	-16
Code Letter	E	G	H	J	K	M
Proof Pres. Test (psig)	600	600	500	500	400	400

TABLE 7-3
Type II Hose Proof Pressure

Hose Size	-8	-10	-12	-16	-20
Code Letter	H	J	K	M	N
Proof Pres. Test (psig)	2000	1800	1800	1800	1800

TABLE 7-4
Type III Hose Proof Pressure

Hose Size	-3	-4	-5	-6	-8	-10	-12	-16	-20	-24
Code Letter	D	E	F	G	H	J	K	M	N	P
Max Operating Pres. (psig)	1500	1500	1500	1500	1500	1500	1000	1250	1000	1000

SEE E.O.

TABLE 7-5
Type IV Hose Proof Pressure

7.2.2 **Sleeved Hose Assemblies**

Hose assemblies with captive firesleeves require special care in processing to ensure a moisture free condition under the sleeve. Proof test hose assemblies with captive sleeves by pulling the sleeve back from the end fittings and hold at the proof pressure for the time specified.

7.3 Cleaning Requirements

7.3.1 Hose assembly shall be cleaned after proof pressure testing.

7.3.2 External surfaces of captive firesleeved hose assemblies shall be kept dry.

7.3.3 Flush the hose bore with Stoddard solvent.

7.3.4 Dry the hose bore with oil free, compressed air at room temperature.

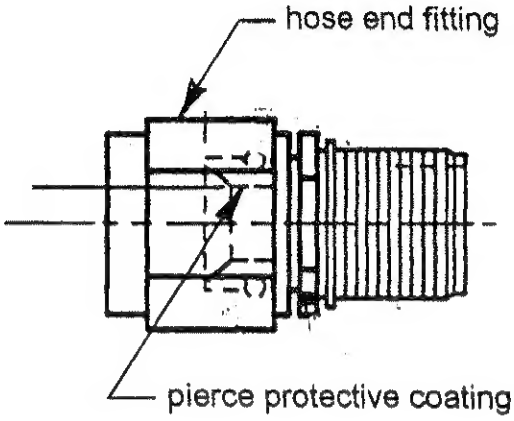
7.4 Electrical Conductivity Test

7.4.1 **Type I, III, and IV Hose Assemblies**

Each hose assembly shall be tested for electrical resistance. The electrical resistance shall not exceed 0.5 megohms. This test shall be conducted by piercing the anodize or other protective coating on the metal fitting's inside diameter surface, with a sharp instrument or an equivalent means (see Figure 7-6).

7.4.2 **Type II Hose Assembly**

Each hose assembly shall be tested for electrical resistance. The electrical resistance shall not exceed 21 megohms per inch of hose length. This test shall be conducted by piercing the anodize or other protective coating on the metal fitting's inside diameter surface, with a sharp instrument or an equivalent means (see Figure 7-6).



ELECTRICAL CONDUCTIVE TEST POINT
FIGURE 7-6

7.5 Inspection Documentation

A copy of the form shown in Figure 7-7 shall be prepared for each group of hose assembled (maximum of 12 hose assemblies). This document shall be maintained in the permanent inspection files.

Acceptance Data Sheet

Process Specification No. _____

Work Order No. _____

Aeroquip Hose Assy P/N (if applicable) _____

Era Hose Assy P/N _____

Quantity _____

	Technician	Inspection
Hose Assembly. Assembled in accordance with process specification listed above.		
Examination of Product. Each hose assembly shall be carefully examined to determine conformance with applicable Aeroquip drawing or Era Process Specification with respect to design, materials, dimensions, finish, and conformance with applicable standards.		
Proof Pressure Test. Each hose assembly shall be tested in accordance with process specification listed above. Number of Hoses Tested _____		
Conductivity Test. Each hose assembly shall be tested in accordance with the Process Specification requirements. Record results: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____		
Data Tag. Each hose assembly shall be marked with: ERA AVIATION INC ERA PART NUMBER AEROQUIP PART NUMBER (IF APPLICABLE) FAA / PMA ERA WORK ORDER NUMBER DATE OF ASSEMBLY		
Signed: Quality Assurance _____ Title: _____ Date: _____		

FIGURE 7-7

8 REWORK AND SALVAGE OF COMPONENTS

8.1 Rework of Hose Assemblies

Assemblies failing to satisfy certain quality assurance provisions specified in Section 7 may be reworked. Assemblies with crimped fittings cannot be adjusted for incorrect angular relationship between end fittings.

8.2 Salvage of Components from Assemblies

8.2.1 **Fittings**

8.2.1.1 Reusable aluminum and steel end fittings may be disassembled and reused if in serviceable condition.

8.2.1.2 Aluminum compression crimp fitting components are not salvageable.

8.2.2 **Hoses**

All sizes of hose may be salvaged by cutting off the end fittings.

9 PREPARATION FOR SHIPPING OR STORAGE

9.1 Hose Sealing

9.1.1 Proper caps or plugs shall be installed on all end fittings to prevent foreign objects, insects, etc. from entering the hose assembly.

9.1.2 Caps or plugs that can be forced into the hose assemblies or that will allow installation of the hose assembly without removal of the cap or plug shall not be used.

9.2 Packaging

Hose assemblies shall be packaged for shipping or storage in accordance with acceptable established practices.